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Research design in a computer-assisted language learning study

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ABSTRACT

This paper discusses research methods for a study focusing on computer-assisted language learning (CALL) field. Various methods are adopted to investigate how to use computers to develop language learners' listening and speaking skills in their English as a second language (ESL) learning. I present research questions, various approaches of data collection and analysis taken in this study. I aim to integrate the results from different data to carry out a holistic study. From a variety of research tools, I hope to explore the phenomenon of using computers for language learners to develop their language skills in depth.

Key words: *research methods, CALL, ESL, listening and speaking*

INTRODUCTION

With the development of technology, many studies have been conducted to investigate the effect of the use of computers in language learning, and many findings and evidence provide positive evaluation in this field (see Warschauer and Healey, 1998, Chapelle 2001, 2003 and Hegelheimer and Tower, 2004). Several studies carried out at universities illustrate that computer programs have been used in university language centres to support students in developing their language skills including listening and speaking both for academic and general purposes (e.g. Gilmour, 2004 and Watson and Wright, 2005). However, much of the research discusses listening and speaking separately. In the present study, they will be discussed together because they are related to each other in language learning (Murphy, 1991 and Hedge, 2000). Moreover, many of CALL studies discuss individual learning, the teachers' role and collaboration between students in developing listening and speaking skills separately. A more appropriate view would be to see them in combination. In my study, these three aspects will be brought together, setting up my research questions. Hence, this study is interested in exploring in detail how computers are used in the ESL courses to develop students' listening and speaking skills in university language centers. I look at how students use computers to carry out individual study, how teachers provide support and how students have collaboration when using computers to practise their language skills. Therefore, the research questions are:

1. What computer programs and computer-based tasks do the target language centers provide for developing students' listening and speaking skills?
2. What are the perspectives of teachers and students in the target university language centers in using computer programs to develop listening and speaking skills?
3. How do students develop their listening and speaking skills on computers for self study?
4. What types of support do teachers provide for students when working on computer-based tasks?
5. In what ways do students collaborate when completing tasks using computers for listening and speaking?

RESEARCH METHODS DESIGN

With the increasing variety of software and online programs in ESL field, there has recently emerged interest in the ways in which the computer can be used to support language learners to improve listening and speaking skills in their ESL learning (Hegelheimer and Tower, 2004, Chen *et al.*, 2004 and Watson and Wright, 2005). However, although these studies have provided evidence or suggestions concerning the use of computer programs for listening and speaking, their findings could have been strengthened if they had used other types of data, for example interviews with teachers and students. Findings from limited source of data may not be holistic because they cannot prove their results from different methods. Therefore, it is important to use various methods research to explore more sources of data (such as interviews, questionnaire and observation) to carry out an in-depth study in the CALL field.

This study explores the impact of using computers in university language centers for developing students' listening and speaking skills in and out of class. It covers what kinds of computer-based tasks are used, how interactions between people emerge and what the perceptions of teachers and students are regarding using computer programs for listening and speaking. Large amount of information needs to be collected from teachers and students. Thus, an investigation in detail is required. For such research, it is advisable to draw on multiple sources of information from teachers and students to obtain in-depth understanding of a complex social phenomenon (see Stake, 1994 and Bogdan and Biklen, 1998). Tashakkori & Teddlie (1998), Tashakkori & Teddlie (2003), Creswell (2003) and Morse (2003) also suggest that the researcher can use mixed research methods to fulfil this type of research aim. Hence, an in-depth study with a variety of methods is considered to be suitable for this research.

I adopted several types of data collections, such as interviews, questionnaires and observation to triangulate my findings. The combination of the three methods can achieve the goals of this study. This is because that this study is interested in the experience and opinions from teachers and students, so it is most appropriate to talk with them. In order to see what happens in the computer room and get direct evidence on how the teacher and students use computer software or online programs to develop listening and speaking skills in the computer room, can be done through observation. The study explored insights, feelings and experiences through interviews with students and teachers and through observation in the computer room. Some questions in this study contained "what" and "how much" in asking participants' perspectives, for example, "How much do you like to use computers for speaking activities?" Hence, this study also used questionnaires.

These research methods, interview, questionnaire and observation, allow me to develop this study as comprehensively and completely as possible (Morse, 2003). Further, the analysis is based on holistic factors from various methods rather than isolated factors (Denscombe, 1998). Thus, they help me extend my understanding of the specific situation.

Sampling

After a survey conducted by sending a questionnaire to forty university language centers in the UK, two university language centers were selected to conduct an in-depth study. They are University A Language Center and University B Language Center. The two centers provide computer programs including software and online programs for students to improve their listening and speaking skills in pre-sessional courses in summer. Approximately 100 overseas students in University A Language Center and 120 students in University B Language Center studied English in their summer pre-sessional courses. These students (about 200) would be sufficient for my data collection. Students were at different levels in their study, from undergraduate to doctoral

level students. They came from different countries, such as Italy, Cyprus, Korea, Japan, China, Philippine and Brazil. In addition, all courses focused on language skills study, including listening and speaking skills, and had in their schedule use of computer programs to develop listening and speaking skills in the computer room every week. This meant that both teachers and students would have opportunities to use these computer programs every week.

Questionnaire

The questionnaire was for students in the target language centers and it was intended to investigate their experience, perceptions and opinions of how they used computer-based tasks, if they liked using computers and which way they preferred to use the technology for developing listening and speaking skills. This is guided by several researchers. Questionnaires can be used for exploring people's attitudes, perception, views and opinions (Black, 1999). Denscombe (1998) also suggests that the questionnaire can offer confident results with statistically significant outcomes. Further, according to Cohen *et al*. (2000, p.129), the questionnaire is more reliable than interview because of its anonymous feature, which "encourages greater honesty." More importantly, CALL research methods which can present evidence about learner's opinions on the value of the CALL task are required. These opinions can be collected by using questionnaire data (Chapelle, 2001).

The above discussions support my intention of using questionnaires to collect as much as information from students to explore their feelings and opinions about the use of computers for developing listening and speaking skills. Questionnaires helped me get a large amount of information through from around 200 students who came from various culture backgrounds at the two language centers in a short time. I designed the questionnaires in anonymous way to ensure their reliability (Cohen *et al*., 2000). I used computer software to analyse data more quickly and to present the results via tables to obtain statistically significant outcomes (Denscombe, 1998 and Dörnyei, 2003).

However, there are some disadvantages to questionnaires. For example, Denscombe (1998) argues that in terms of quantitative data and questionnaires, the analysis can be difficult with large amounts of data. Respondents might not cooperate with pre-coded questions, which might bias the researcher's findings as well. The rate of respondents might be lower than other research approaches. Therefore, the quality of data from quantitative research can be seen as suspect in some way. The analysis of quantitative data is not as scientifically objective as it purports to be reliant. Furthermore, questionnaires were limited in this study because I was not able to follow up comments students made or probe into their responses in the questionnaires. I wanted to explore more detailed data from both the teachers and the students, which helped me triangulate with the questionnaire data. I needed much more insight into what the teachers and students thought about using computers. In order to compensate for these limitations, this study also used interviews and observation as research techniques.

Analysis of Questionnaires

The analysis of the questionnaires provided me with a general idea about the levels of computer use amongst the students, the students' understanding of computers and their perspectives on using computers in ESL learning. First, I coded the data into numbers, and proceeded through stages for analysis of questionnaire data; as Dörnyei (2003) suggests, the first step in processing questionnaire data is coding data and developing a coding framework. In this study, as most of questions were structured, in order to present the data, a coding framework was set up to reflect

the questionnaire. For example, 'Strongly agree' was coded '1', 'Agree' was coded '2', 'Disagree' was coded '3' and 'Strongly disagree' was coded '4'. All questionnaire data was entered into the statistical analysis computer package, SPSS.

Second, the percentage and frequency of responses were produced in the form of tables for each question. For example, the frequency of students who used computers to practise their listening and speaking skills in and out of class; and the percentage students liked using the technology in general and even in some specific computer programs or tasks. This stage followed Denscombe's (1998) suggestion that the second stage is to make the data into a tally of the frequencies which offers a clear picture of which responses occur more frequently than others. Third, the statistical analysis focused on descriptive techniques to describe the percentages and frequencies of what the tables showed, because, as Denscombe (1998) states, the researcher can use descriptive statistics to describe the frequencies and distribution, which "provide a succinct and effective way of organizing quantitative data and communicating the findings to others", so that the researcher "can interrogate their results relatively quickly" (Denscombe, 1998, p.205). Finally, the results were analysed together with the data from interviews and observations and their relationships were explored to see whether they support to each other or not, following the research questions.

Interview

This study employed interviews as a second research technique because the interview was likely to offer a more in-depth view than questionnaires. The main purpose of interviews in this study was to explore what kinds of computer-based tasks teachers and students are using and how they use these tasks for developing listening and speaking skills. A further purpose was to explore teachers' and students' opinions regarding advantages and disadvantages of using computers in these contexts, and ask for their suggestions of using computers for developing listening and speaking skills.

The literature on research methods supports this approach (Punch, 1998, Denscombe, 1998 and Wellington, 2000). For example, Punch (1998) states that the interview can access interviewees' perceptions, meaning, definitions and constructions of the situation. Denscombe (1998) agrees that interviewing is appropriate when researchers want to obtain information about people's motivations, experiences, opinions, or feelings. Interviews can provide an in-depth insight into the topic and can produce data in detail so that the researcher can get valuable information and ideas from the respondents. This is the aim of the interviews used in this study, that is, to investigate interviewees' opinions, experiences and feelings in using computers in depth. Furthermore, researchers can explain their questions and ask for clarification about responses researchers are not clear about (Wellington, 2000). In the interview, when responses were unclear answers, I asked interviewees to clarify or check what they said to check accuracy and relevance. I also asked interviewees to expand their answers, when I wanted to find more examples or evidence. I also explained my questions to the interviewees when they were unclear with my questions. In these ways, I aimed to ensure that the data was as valid as possible.

For types of the interview, I used semi-structured interviews which are more flexible. They can help interviewees to speak more widely and develop their own thoughts to reach more depth than structured or unstructured interviews (Denscombe, 1998). Bogdan and Biklen (1998) also note that semi-structured interviews allow researchers to become confident in obtaining reliable data across subjects. Therefore, according to their recommendations, I conducted semi-structured interviews for this study to allow me to ask some follow-up questions and probe to get more reliable details.

Most of the questions were followed by several sub-questions to invite interviewees to provide as more details as possible. In terms of teachers' interviews, I intended to interview 6-8 teachers in each center. I explored why teachers integrated computers into their teaching, how they used CALL programs, and how they provided support when students worked on computers. Interviews with teachers can give a more comprehensive picture of their teaching and perceptions, and increase my understanding on the content and methods of using computers for listening and speaking. 10-12 students in each center were also invited to participate in individual interviews, because students would offer valuable feedback and suggestions on the use of computers in language learning, which might be then considered by teachers and computer program designers for language teaching and learning. This is guided by Murphy *et al.* 's (2001) suggestions that it is valuable to listen to students' reactions which may help teachers to modify their strategies for students' interaction. Teachers have to rethink and realign their assumptions of their teaching with computers according to students' feedback in most of the case studies. As Murphy *et al.* (2001, p.172) propose:

> *"Perhaps even more important, especially when developing online and other computer-based forms of teaching, is the need to involve students in development as soon as possible."*

Thus, it is important to listen to students' perceptions and experience of using computers for listening and speaking in their language learning. Hence, I also conducted interviews with students.

A group interview was carried out in the two language centers as well, one group per center. This follows Lewis (1992) and Fielding and Thomas's (2001) suggestions that group interviews can help interviewees challenge the idea between each other and can help researchers see how interviewees interact in the relevant context and work out a common view or various views. Group interviews can be employed for triangulation aims or used in conjunction with other data (Denzin and Lincoln, 1994). As Denzin and Lincoln (1994, p. 365) highlight, the group interview is "data rich, flexible, stimulating to respondents, recall aiding, and cumulative and elaborative, over and above individual responses."

Thus, in this study, I wanted to use the group interview to develop greater discussion among students to obtain more details regarding their feelings and experiences. It was hoped that interviewees in the group interview would listen to each other's contributions so that they may develop their ideas more clearly. New insights, new information and another level of data gathering or perceptions on the context of this study may occur in the group interview, which may not be available through the individual interview (Maykut and Morehouse, 1994 and Denzin and Lincoln, 1994).

However, the interview has some problems as well. For example, sometimes the researcher cannot obtain all answers he/she expects from the interviewees, and it takes time to write the transcription of the tapes. The researcher has to make sure the tape recorder is actually working. Cicourel (1964) points out some problems of the interview. For example, different interviewee has a different situation. If the question is too complicated, the respondent may find it difficult to answer, or even cannot reply.

Analysis of Interviews

The purpose of the analysis of interviews for this study is to gain in-depth insights from the views of teachers and students in using computers for listening and speaking. According to Ryan and Bernard (2003), finding themes is an important step before analysis. The themes for analysis can

be found in literature reviews and researchers' values (Bulmer, 1979). The themes can come from what the researcher sees during data collection and the researcher's mind through the process of the research (Holliday, 2002). There are three main focuses of this study: the role of computers in students' individual learning, the role of teachers and collaboration between students. Thus, these three aspects were identified as the main themes in the analysis. Meanwhile, I also wish to explore what CALL programs and tasks are used in target language centers and participants' general perspectives for them. Therefore, following the above discussions, five major categories in this study emerged from the research questions.

The process of analysis of interview data for this study follows some researchers' suggestions below. First, as Atkinson and Heritage (1984) suggest, transcriptions are basic research activities. They involve close and repeated listening to recordings. Heritage (1984: 237) also states: "The tape-recording and transcript allow both analyst and reader to return to the extract either to develop the analysis or to check it out in detail." The transcription can offer a 'true' record of the original interview (Drever, 1995). Second, according to Marshall and Rossman (1995), data analysis includes several stages: organizing the data; generating categories the data; and searching for interpretations. In addition, analysis of qualitative data is inevitably interpretive (Cohen *et al*. 2000), and the process of analysing qualitative data is framed by researchers' questions (Maykut and Morehouse, 1994). Similarly, Wolcott (1994) suggests three main ways to present data. The first way is to stay close to the original data treating it as descriptive data. This helps to tell the informants' stories. The second way is to extend descriptive data with careful and systematic analysis to identify key factors and relationships. The third way is to interpret data to make sense of understanding or explanation from the analysis. As Strauss and Corbin (1990) indicate, data analysis requires researchers' selection and their own interpretation of the data.

Therefore, first, all interview data was listened to carefully and repeatedly and transcribed into the computer (Atkinson and Heritage, 1984). And then I listened to all interviews again, to check them out in detail (Heritage, 1984). Second, the data was organised and grouped the responses into the five categories which were framed by the research questions, in order to make it easier see the questions (Maykut and Morehouse, 1994 and Marshall and Rossman, 1995). Third, I searched for interpretations to describe the interviewees' stories to make sense of understanding from the data and discovered key points to analyse their relationships (Strauss and Corbin, 1990, Wolcott, 1994 and Cohen *et al*., 2000). During the analysis of interviews, I returned to the transcriptions to get more information to add into the analysis where needed.

With respect to the third category, for example, 'computer-based tasks for individual study', I grouped all interviewees' responses to the four interview questions which focused on this category. For instance, one question in the student interview focused on how the students' perceived their own improvements in listening and speaking using computer applications. I grouped all answers from participants for this question in the computer with the use of NVivo which helped me to locate all the responses within the same question. I wrote my initial comments after each response. I then picked up their key comments within similar responses. I generalised how many students reported their improvements on listening or speaking as well as specific programs they recognized useful for their improvements. Next, I provided detailed examples of what participants' said based on the aspects above during the analysis. I found relevant findings from the questionnaire and added literature to support this result focusing on 'motivation' within the third category.

Finally, I synthesized all these results from interviews, questionnaires and observations within the five categories to make a holistic analysis (Denscombe, 1998). When I analysed interview data, for example, teachers and students presented some tasks they did in the computer room, I would triangulate my findings with observation and questionnaire data. When student interviewees said they liked completing some computer-based tasks, I would find whether many other students

liked completing them as well from the responses in the questionnaire. I would also look at the extent to which students appeared to concentrate in their tasks in the computer room during the observation**.**

Observation

Observation was used as the third research technique, because although questionnaires and interviews provide data about the perceptions of the participants, they do not provide data about what actually takes place in the classroom. As Chapelle (2003, p.97) asserts: "One approach to understanding technology use is to carefully observe learners at work." Denscombe (1998, p.139) also supports her point that observation "draws on the direct evidence of the eye to witness events first hands It is based on the premise that, for certain purposes, it is best to observe what actually happens."

In terms of types of the observation, in order to have deeper understanding about the use of computers for developing listening and speaking skills in the computer room, this research employed non-participant observations at the two university language centers because I did not intend to involve myself and participate in activities (see e.g. Burns, 1999). I only wanted to watch and record the process of activities of involved in using computers for listening and speaking in the computer room by taking field notes and a tape-recorder. Also it is impossible for me to be involved in their activities in class. Hence, I did not involve myself and participated in activities and I took the non-participant observation for this study. Thus, the aim of the observation in this study was to use my own eyes to see direct evidence and to provide information on:

- What happens in the computer room when students use computers for developing listening and speaking skills
- How students complete the computer-based tasks to practise their listening and speaking skills
- What kinds of support teachers provide for students' listening and speaking tasks on computers
- What kinds of collaboration between students take place in the computer room

To observe, video camera recording, tape-recording and written recording are three main techniques (Denscombe, 1998). According to Foster (1996) and Wragg (1999), using a camera in the classroom can affect what students do and some events will be out of camera shot, because of the restricted visual range of the video. Moreover, it is sometimes not easy to obtain all teachers and students' permission for using a video in their classroom and even if permission is obtained, "reactivity will increase", which is "a serious drawback" (Foster, 1996: 87). Students might not work naturally if I used a video camera to record one off sessions in the classroom. Rather, I watched and wrote field notes to record the process of activities students involved in using computers for listening and speaking. Taking written records allowed me to provide descriptions of the situations, such as what happened, what tasks they did, the time they spent on computers and discussions with peers. These descriptions helped me to make detailed reports and further analyse the data. I also used a digital tape-recorder to record what teachers and students actually said and talked in the computer room after obtaining their permission. The audio recorded data helped me find examples of their speaking or discussions during the analysis. I made transcriptions from my field notes with written and audio records as soon as possible after observations, while they were easily remembered (Denscombe, 1998).

I intended to observe 2-4 lessons in the computer rooms in each of the centers. In the observation, I focused on what computer-based tasks students completed and how teachers set up activities for the students. I looked at what the students were asked to do in order to complete

the task, such as listening to a lecture or a conversation and making comments. I also noted whether they worked individually or worked in pairs or groups for collaboration.

Analysis of Observations

Regarding the analysis of observation, I used a narrative description (Nunan *et al.* 1990) to explain what I observed in the computer classroom. I described what teachers and students did with the use of computers for supporting listening and speaking skills in the computer room. This descriptive analysis aimed to provide an overview of the interaction among teachers and students while using computers within the context of the computer room. As Scott (2001, 2005) suggests, the narrative description can offer an overview of the nature of the communication in the context, enrich the report of activities in the class and provide additional information related to perceptions of teachers and students in language teaching and learning.

The analysis of the observation data followed the categories of the analysis of interview data, focusing on the kinds of computer-based tasks were used, what kinds of activities teachers set for developing listening and speaking skills; how the teacher and students used computer-based tasks from computer software and online programs to support students' listening and speaking and how students interacted as they worked on the task in the computer room. It was combined with data from interviews and questionnaires.

DISCUSSION

This paper reported the research methods based on various data collection in a CALL study. It provided rationales for the decisions I made. The use of multiple sources of evidence in this study allowed me to have findings or conclusions which are more convincing and accurate in a process of triangulation than isolated factors (Yin, 2003). I employed the three research methods to triangulate information and data in order to support and provide checks and balances for each other. All the analysis of questionnaires, interviews and observations were synthesized following each research question. The relevant information from the three types of data were identified and put into categories for the analysis. It is expected that the combination of various data sources can help to check each other to obtain valid and reliable data. As Cohen *et al*. (2000) suggest, the triangulation of different research methods may enhance the reliability and validity by the checks to each other.

The strength of this study is that it covered students' individual learning, teachers' support and collaboration between students in using CALL resources for language teaching and learning. Thus, it provides a holistic picture of the use of computers to develop both students' listening and speaking skills, drawing together the interrelated complex factors that influence classroom teaching and learning. In addition, with various methods, I not only interviewed teachers but also students to explore their perspectives of using computers for listening and speaking. I also received questionnaires from more than 100 students in the two centers to explore their perceptions and feelings which coincide with the interview data. Moreover, I used my own eyes to see how teachers and students used CALL programs for listening and speaking in the computer room. Therefore, the triangulation of the three sorts of data collection makes good and strong findings for this research. It is hoped that this study can enrich the research policy and practice in CALL field, particularly for supporting listening and speaking and drawing attention to all three aspects including individual learning, teachers' support and learners' collaboration as well as using a variety of research methods in CALL research.

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